pennsylvania
DEPARTMENT OF ENVIRONMENTAL PROTECTION

SOUTHEAST REGIONAL OFFICE

MEMO

TO James D. Rebarchak
Manager, Regional Air Quality Program
Southeastern Regional Office

FROM Jing Y. Guo
Facilities Permitting Section
Air Quality Program

THROUGH Janine Tulloch-Reid, P.E.
Manager, Facilities Permitting Section
Air Quality Program

DATE November 2, 2020 DRAFT

RE Review Memo for Operating Permit Renewal
TVOP No. 23-00089
Marcus Hook Energy, L.P./750 MW
Marcus Hook Borough
Delaware County
APS No. 562726, AUTH No. 1316597; PF: 654588

1. Introduction

On June 02, 2020, Marcus Hook Energy, L.P./750 MW (MHE 750MW), submitted an Operating Permit Renewal application for their electric power generation plant, located at Marcus Hook Borough, Delaware County, along with the application fee.

MHE 750MW generates electric power for sale to the PJM grid. This facility operates three identical combined cycle combustion turbines (CT) constructed in March 2003. Each combined cycle turbine consists of a natural gas-fired combustion turbine [dry low NOx combustion (CT, 1,949 MMBtu.hr)] and a heat recovery steam generator (HRSG) with a duct burner (333 MMBtu/hr), and its exhaust is treated by a selective catalytic reduction (SCR) unit with ammonia as reduction reagent for NOx emission control. Each CT has its own stack with a CEMS monitoring NOx and CO concentration. The turbines are capable of being operated as either a simple cycle turbine rated at 183 MW, or a combined cycle turbine when operated with the duct burner that increases the rated capacity, with a total facility electrical output of 750 MW (nominal).

2. Source Emissions and Changes

The emission sources at this facility are tabulated below:

Table 1. Emission Sources

Source ID	Name	Description
101	Combustion Turbine 1 & Duct Burner 1	Each turbine & duct burner heat input: 2,282 MMBtu/hr
102	Combustion Turbine 2 & Duct Burner 2	
103	Combustion Turbine 3 & Duct Burner 3	
104	Cooling Tower w/mist eliminator	8.904 Million Gal/hr water
105	Parts Washer	
C01	CT1 Selective Catalytic Reduction	Treating Turbine 1 & duct burner exhaust
C02	CT3 Selective Catalytic Reduction	Treating Turbine 2 & duct burner exhaust
C03	CT3 Selective Catalytic Reduction	Treating Turbine 3 & duct burner exhaust

Notes:
1) The facility owns and operates a diesel engine fire pump which is physically located in Delaware State. This engine (John Deere 340 bHP, manufacture year: 2002) is currently permitted under neither Delaware State nor Pennsylvania State Air Quality Operating Permit.
2) Source IDs 101, 102, and 103 are also permitted under Phase II (Title IV) Acid Rain Permit.

This facility operates from a 1x0 configuration (one combustion turbine) to a 3x1 configuration (three combustion turbines and one steam turbine) to meet electric market demands. Four (4) Auxiliary Boilers (392.5 MMBtu/hr each, owned by SPMT), previously operated and maintained by the permittee, are now fully owned and operated by SPMT (since at least 2016). MHE 750MW produces its own steam through the operation of the three combustion turbines and its associated duct burners and provides a portion of that steam to SPMT as needed.

Emissions

Table 2 summarizes the actual emissions from the operation of the combined cycle combustion turbines from 2016 to 2019. The amount of PM emissions from the cooling tower (Source ID 104) is estimated as 2.543 lb/hr.

Table 2 – Actual Annual Emissions (tons/yr)

Year	NO_x	PM10	VOC	SO_2
2019	212.2	23.5	12.4	9.5
2018	211.4	24.6	12.3	9.1
2017	244.0	41.2	16.0	11.9
2016	240.0	42.9	14.5	13.8

MHE 750MW is categorized a major (Title V) facility for NOx, CO, PM10, and SO_2 emissions, and a minor source for HAP emissions based on its criteria pollutant potential-to-emit rate. In accordance 40 CFR § 98.2(a)(1), MHE 750MW is subject to the requirements of 40 CFR Part 98 – *Mandatory*

Greenhouse Gas Reporting, as the facility contains electricity generation units as listed in Table A-3 to Subpart A of 40 CFR Part 98.

The facility is major for GHG emissions; but PSD is not triggered for GHG emissions because there are no new installed sources and no modifications to the existing sources (no emission increases or decreases). PSD permitting does not apply (Greenhouse Gas Tailoring Rule).

Aggregation

Title V Operating Permit for MHE 750MW was initially issued in 2009. At that time, this plant and Sunoco R&M, Inc. were Title V facilities located on the same property. For New Source Review (NSR) and Prevention of Significant Deterioration (PSD) review of both facilities, MHE and Sunoco were held to emission caps on nitrogen oxides (NOx), sulfur dioxide (SO_2), and particulate matter (PM).

After considering EPA's three-pronged criteria for making a single-source determination [the pollutant-emitting activities belong to the same industrial grouping, are located on one or more contiguous or adjacent properties, and are under the control of the same person (or persons under common control)], the Department had later determined that the air contaminant sources located in MHE 750MW shall be considered as a single facility for NSR and PSD applicability purposes (Attachment 1 – Adjacent Facilities and Aggregation Analysis).

Permanent Shutdown of MHE 50MW Plant

In 2019, Marcus Hook Energy shut down their MHE 50 MW plant permanently, and their operating permit, TVOP 23-00084 for MHE 50 MW was revoked in February 26, 2020 (see Attachment 2). Therefore, MHE 750 MW plant is currently considered as a single facility for Title V applicability review.

AGP Modifications (RFD in paper form)

On November 14, 2018, Marcus Hook Energy submitted an RFD for installing Advanced Gas Path (AGP) technology (including improved software and replacement components) on three units of combustion turbines at their MHE 750WM facility. DEP determined that the AGP upgrade is part of the manufacturer's normal recommended inspection, operation, and maintenance plans for the combustion turbine units. This project was exempt from plan approval requirements under 25 Pa. Code § 127.14(a)(9) and 127.14(c)(2). The AGP upgrade was implemented during the 2019 outages.

Fuel

SPMT had ceased operation as a refinery, currently is a natural gas storage facility. SPMT had constructed cryogenic ethane, propane, and natural gasoline (liquid natural gas) storage tanks. MHE 750MW currently uses SPMT gaseous fuel(s) (process gas, not refinery gas) in the duct burners (see Attachment 3).

Stack Testing

The facility performed stack testing on December 19, 2016 and January 2017. The results were passing (Attachment 4).

3. Regulatory Analysis Update

The construction of these combined cycle turbines trigged the Prevention of Significant Deterioration (PSD) program and the New Source Review (NSR) Program. A summary of regulation applicability is shown in Table 3, below.

Table 3. Regulation Applicability

Regulations		Applicability
40 CFR Part 97	Subparts AAAAA and BBBBB (TR, NOx) Subpart CCCCC (TR, SO_2)	Applicable to this facility (CSAPR)
40 CFR Part 98	Mandatory Greenhouse Gas Reporting	Applicable to this facility (stand-alone)
40 CFR Parts 72-78	Acid Rain Program	Applicable to this facility, for SO_2 emissions only (Acid Rain Permit is issued under separate cover concurrently with Title V permit)
25 Pa. Code §127.531	Acid Rain	Applicable to this facility
40 CFR Part 60 Subpart KKKK	**Standards of Performance for Stationary Combustion Turbines**	**Applicable to the turbines & duct burners due to the AGP project, as per 40 CFR §60.4305**
40 CFR Part 60 Subpart GG	Standards of Performance for Stationary Gas Turbines	Not applicable as the facility is subject to NSPS Subpart KKKK.
40 CFR Part 60 Subpart Da	Standards of Performance for Electric Utility Steam Generating Units	
25 Pa. Code §129.63	Degreasing operations - (a) Cold cleaning machines	Applicable to Parts Washer
40 CFR Part 75	Continuous Emission Monitoring (CEMs)	Applicable, continuously monitoring NOx, CO and O_2
40 CFR Part 64	Compliance Assurance Monitoring (CAM)	Not applicable according to 40 CFR §64.2(b)(1) [with CEMS and subject to Acid Rain Program]
40 CFR Part 60 Subpart Db	Standards of Performance for Industrial-Commercial-Institutional Steam Generating Units	Not applicable according to 40 CFR §60.40b(e)

New Source Performance Standards (NSPS) 40 CFR Part 60, Subpart KKKK – *Standards of Performance for Stationary Combustion Turbines*

Applicability of the NSPS Subpart KKKK requirements were triggered as a result of changes to the combustion turbines, as described in a Request for Determination (RFD) submitted by the facility on November 14, 2018. The changes involved the installation of improved components on each of the combustion turbines (Source IDs 101, 102 and 103) (Advanced Gas Path" upgrade, or AGP upgrade). The AGP upgrade was implemented during the 2019 outages. Since this AGP upgrade took place post February 18, 2005, the facility became subject to NSPS Subpart KKKK. The combustion turbines and duct burners no longer subject to NSPS Subparts GG and Da.

CSAPR

From January 1, 2015, this facility has been subject to the following subparts of the Cross-State Air Pollution Rule (CSAPR), or Transport Rule (TR), as codified in 40 CFR Part 97:

- Subparts AAAAA and BBBBB (relating to TR NOx annual trading program; and TR NOx ozone season trading program) replaced the CAIR requirements codified in 40 CFR 97, Subparts AA and AAAA (relating to CAIR NOx annual trading program general provisions; and CAIR NOx ozone season trading program general provisions).

  Specifically, for each ozone season beginning after January 1, 2015, DEP intends to accept the surrender of annual and ozone season TR NOx allowances as a compliance alternative to the surrender of annual and ozone season CAIR NOx allowances if the TR allowances are surrendered for compliance purposes in a manner consistent with the surrender provisions for CAIR allowances set forth in the applicable sections specified in this notice. DEP consulted with staff in the United States Environmental Protection Agency (EPA) Region III Office in developing an alternative allowance surrender approach for compliance with the applicable SIP-approved requirements. To this end, the EPA has confirmed, in writing, that TR NOx allowances may be surrendered as set forth in the applicable regulations in 25 Pa. Code Chapters 129 and 145. A detailed notice was published in the PA bulletin on April 4, 2015 [45 Pa. B. 1687].

- Subparts CCCCC or DDDDD (relating to TR SO_2 Trading Program) replaced the CAIR SO_2 requirements, codified in 40 CFR 97, Subparts AAA. This facility is subject to Group 1 SO_2 applicable requirements in 40 CFR Part 97 Subpart CCCCC as the facility is located in Pennsylvania. It must be noted that Title IV SO_2 allowances (Acid Rain Permit Allowances) are distinct from the TR allowances.

ACID RAIN (Title IV)

The facility is subject to the applicable Acid Rain requirements in 40 CFR Parts 72 through 78, and the requirements contained in 25 Pa. Code Section 127.531. The facility shall comply with all requirements in their Phase II Acid Rain Permit, which has been issued by DEP, effective January 1, 2021 through December 31, 2025 (as a stand-alone document).

4. Permit Updates

Updates requested by the facility [***bold italicized*** indicates an addition, ~~strikeout~~ indicates a deletion]

1. Section D, Source IDs 101, 102, and 103 (Combustion Turbines and Duct Burners)
   The facility requested, "as a result of the AGP project, heat input be increased to 2,357 MMBtu/hr from 2,282 MMBtu/hr for the combustion turbines and duct burner".

   During the renewal process, the facility informed DEP that the AGP project did not result in heat input increase. Therefore, heat input remains unchanged (see Attachment 3).

2. Section D, Source IDs 101, 102, and 103 – Condition #011
   The facility requests to modify the following condition:

"When gaseous fuel is not used in the duct burner for more than ~~12 consecutive months~~ ***a calendar year***, the permittee shall conduct the 720-hour total sulfur variability standard deviation test within 5 days when gaseous fuel is used again as fuel in the duct burner."

The existing testing requirement is more stringent than the proposed condition (with "a calendar year" basis). Thus, this condition remains unchanged.

Updates made by DEP [***bold italicized*** indicates an addition, ~~strikeout~~ indicates a deletion]

1. The facility name had been updated.
2. Testing conditions in Section C had been updated.
3. Condition #022, of Section C, "*The air contaminant sources located in FPL Energy Marcus Hook, L.P., which are permitted under Title V operating permit No. 23-00089 and the air contaminant sources located in FPL Energy MH50, L.P., which are permitted under Title V operating Permit No. 23-00084 shall be considered as a single facility for New Source Review (NSR), Prevention of Significant Deterioration (PSD) and Title V applicability purposes*", is deleted as FPL Energy MH50, L.P. was shutdown permanently and their permit had been revoked.

For Source IDs 101, 102, and 103 in Section D:

3. SPMT has ceased operation as a refinery, is now a natural gas storage facility. Gaseous fuel received from SPMT is referred as "process gas" in the permit. Therefore, "refinery gas" is replaced with "process gas" throughout the permit (Attachment 3).
4. The throughput restriction for the duct burners had been modified as shown below, as the facility produces its own steam through the operation of the combustion turbines and duct burners:

   "*(a). The permittee shall limit the total heat input to the three duct burners at this facility to a combined 6,390,324 million BTU in a 12-month rolling period.*

   (b). The maximum heat input to the duct burner associated with this source shall be limited to 333 MMBTU/hr. ~~*The permittee shall coordinate with SPMT, to show compliance with this requirement.*~~

   (c). The permittee shall limit the three duct burners to a combined heat input of 899 MMBTU/hr ~~*when the four auxiliary boilers (owned by SPMT and operated by the permittee) are being fired simultaneously at maximum rated capacity.*~~ "

5. Condition #007 is modified as follows:
   "(a) The permittee shall combust only natural gas, process gas [gaseous fuel(s)], or a combination of natural gas and process gas in the duct burners. ***The process gas provided by Sunoco Partners Marketing and Terminals, L. P./Marcus Hook (SPMT) shall meet the standards as specified in 40 CFR Part 60 Subpart KKKK.***

6. All permit conditions cited under 40 CFT Part 60 Subpart GG and Da had been removed.

5. Public Participation and Comments

The public was notified as follows:

Pa. Bulletin notice – published on November 13, 2020 ??.
Newspaper notice – DigitalFirst from April 21 to 23, 20XX ??.
EPA notification – via email on, 2020.

6. Recommendation

I recommend issuance of Title V Operating Permit, No. 23-00089, to Marcus Hook Energy, L.P./750MW, located in Marcus Hook Borough, Delaware County.

Attachment 1 – Adjacent Facilities and Aggregation Analysis

Aggregation

The EPA has a 3-pronged criteria for considering whether facilities should be aggregated. *Building, structure, facility, or installation* means all of the pollutant-emitting activities which belong to the same industrial grouping, are located on one or more contiguous or adjacent properties, and are under the control of the same person (or persons under common control) except the activities of any vessel (40 C.F.R. § 52.21(b)(6)) . Pollutant-emitting activities shall be considered as part of the same industrial grouping if they belong to the same "Major Group" (i.e., which have the same first two digit code) as described in the *Standard Industrial Classification Manual, 1972,* as amended by the 1977 Supplement.

The EPA has ruled in favor of aggregating facilities even if the two-digit major SIC codes were different because the other two criteria proved to be strong cases.

The EPA has also ruled that the shared management decisions were significant enough, such that one company paid the other's bills or sat on the board of the other, that there was common control.

Contiguous or adjacent - Contiguous or adjacent is not defined by the US EPA or PADEP and is a case-by-case determination depending on the circumstances. In this case, each of these facilities is contiguous or adjacent to each other. With the exception of the state line running through the property, none of the affected companies is disputing this part of the criteria for determination.

The following is a list and discussion of the seven (7) facilities in question.

Company name/plant	SIC	Sharing of workforce, Mgmt, and/or business decisions*	Contiguous or Adjacent
Sunoco R&M	2911 – Petroleum Refining	None	Yes
SPMT**	4226 – Special Warehousing and storage	Yes with SPMT in Delaware	Yes
MH 750	4911 – Electrical Services	Yes, with MH 50	Yes
~~MH 50**~~	~~4911 – Electrical Services~~	~~Yes, with MH 750~~	~~No~~
SPMT*** (State of DE)	4226 – Special Warehousing and storage	Yes, with SPMT in Marcus Hook	Yes
Rhodia (Solvay)	2843 – Surface Active agents, finishing agents, Sulfonated Oils and Assistants	None	Yes
Braskem	2821, Manufacturing -- Plastic, Plastic Materials and Synthetic Resins.	None	Yes

Notes:
* See below for more detailed summary on these positions.
** MH 50 (Marcus Hook Energy, L.P./50 MW was permanently shut down in 2019.
*** SPMT is the initials for Sunoco Partners Marketing & Terminals.

Sharing of workforce, management, or business decisions.

During the course of any business activity, there are transfers of raw material, products, and/or services between facilities, and this does not extend any further than a contractual agreement between the affected companies. Please see the details described below.

Aggregation issue

Braskem

Braskem was created circa 1991 and has been in operation since then under several business names. It is a distinct corporation which operates and maintains its business structure according to its own suppliers and purchasers, with its own management team and no other financial support. It purchases steam from either Sunoco Partners Marketing & Terminals (SPMT) or Marcus Hook Energy (MH) for the use in their propylene manufacturing operation. Braskem has its own board of directors, management scheme, officers and workforce, and makes independent financial decisions. There is no sharing of products, intermediates, by-products, or raw materials between Braskem and the other 6 facilities. The only items that may possibly link Braskem with any of the above is the purchase of steam from SPMT and/or FPL, and the disposal of process gas containing VOCs by routing them to a flare owned by SMPT in the state of Delaware. Each of these is a contractual arrangement that allows for the efficient use of energy or waste disposal without the need for new construction which would result in additional costs and emissions.

Sunoco Partners Marketing & Terminals (SPMT) – Marcus Hook

SPMT is its own corporation with its own management and workforce separate from the other facilities in the above table, except for SPMT in Delaware. The Delaware facility is physically connected to SPMT in Marcus Hook, except that a state boundary line crosses through their property. The management and staff support all areas of the facility in each state. All decision making for both SMPT's is performed as a single unit. For this reason, along with having the same SIC and being contiguous or adjacent the two SPMT facilities should be aggregated.

SMPT was formed as a part of a larger holding company during the transition period after the sale of the large facilities (from Sunoco (R&M)). These two entities (Sunoco Inc. (R&M) and SPMT) have become purely business partners with no sharing of management, work force, or any decision making.

This facility operates as a storage facility receiving and storing a variety of petrochemical products, then shipping them out via truck, rail, ship/barge, or pipeline to various customers. There is no manufacturing or production of intermediates at this facility.

SPMT also owns four boilers that are used to supply steam for internal uses and through contractual agreements to supply steam to Sunoco (R&M), Rhodia (Solvay), and Braskem. The sale of this commodity is purely a commercial agreement and does not transfer control to the purchaser. Essentially, this arrangement provides energy it and can be terminated upon reasonable notice.

SPMT owns one flare in Delaware that burns its own processes gases and gases from the Braskem facility.

SUNOCO Inc. (R&M)

Sunoco Inc. (R&M) comprises of the remainder of former Sunoco Marcus Hook Refinery. The sources are a small distillation unit (30" Still), two loading racks, and several storage tanks. These are all associated with the making of racing fuel for NASCAR and other outlets that require similar high performance fuel.

The management and staff at this facility are independent of any of the listed entities, and the other entities do not share their staff or management with Sunoco.

This facility is a legal entity on its own and does not purchase or sell any product, raw material, or intermediate to any of the above named facilities. While the facility does have contractual agreements with SPMT and MHE to receive steam, it has no control of the sources producing that product.

Marcus Hook Energy, L.P. (MHE) (Parent Company Next Era) – (the three 750MW turbines and the two 50 MW turbines)

The Department had issued individual Title V Operating Permits for each of these sources (750 MW versus 50 MW). In 2019, Marcus Hook Energy permanently shut down its MHE 50 MW plant; thus, its Title V permit was revoked. MHE 750MW produces electricity for internal use and for sale to the electric grid. Additionally, the 750MW gas turbines each have the ability to produce steam from their

Aggregation issue

waste heat recovery boilers, which can be sold to Sunoco, SPMT, or Braskem. Operation of MHE 750WM is dependent on the electrical demand and agreements in place with PJM. Their operation is not influenced by any other of the above facilities.

The boilers have always had a contractual agreement between Sunoco/SPMT (as owners) and MHE (as the operator). All capital expenditures and decision making has always been made Sunoco/SPMT.

SOLVAY (fka Rhodia)

This facility is a specialty chemical manufacturer specializing in surfactants and related products. It is 100% owned by Solvay Holding Inc, which is a wholly–owned subsidiary of Rhodia S.A. Rhodia S.A. is owned by the ultimate parent Solvay S.A., of which the entire corporate structure has no corporate relationship with any of the above facilities.

As part of the lease agreement, Solvay has contracted to purchase the following commodities from SPMT – steam, water, electricity, and sanitary and storm water discharge. There are no other contracts with any of the above listed companies.

It is noted that SPMT does not produce electricity, but merely passes through the electrical demand to Solvay

SUMMARY

SIC – with the exception of the two (2) SPMT facilities (Marcus Hook and the State of Delaware) the companies do not have the same major 2 digit SIC.

Common control – With the exception of the two (2) SPMT facilities, the management and labor responsibilities are performed entirely by their respective companies. At no time is there any financial input or assistance provided to (or from) any of the other companies. With the exception of steam and a few other services being provided or sold, there is very limited interaction between any of the facilities. This steam can be provided by either the boilers owned by SPMT, by the waste heat boilers of MHE's 750 units. Other than a contract for steam service, which is essentially a long-term purchase order, there is relatively no interaction.

Contiguous or Adjacent – Each facility meets this definition.

After considering EPA's three-pronged criteria for making a single-source determination, the Department has determined that there is no facility in this list that meets all three criteria and therefore does not consider any of these as support facilities for use in determining applicability toward PADEP's NSR or the federal PSD program, except that the two (2) SPMT should be aggregated. However, the MHE and the SPMT facilities should not be aggregated with each other.

Attachment 2 – Memo for Marcus Hook Energy, L.P/50 MW

Marcus Hook 50, LP
Title V Operating Permit No. 23-00084

February 26, 2020

Commonwealth of Pennsylvania
Department of Environmental Protection
484-250-5920

SUBJECT: Title V Operating Permit Revocation
Marcus Hook 50, LP
TVOP 23-00084
Borough of Marcus Hook, Delaware County

TO: James Rebarchak
Regional Program Manager
Air Quality

FROM: Paul Barnhart
Facilities Permitting Section
Air Quality

THROUGH: Janine Tulloch-Reid, PE
Environmental Engineer Manager
Facilities Permitting Section
Air Quality

On February 26, 2020 I performed a closure inspection of the facility. Records indicate that May 3, 2019 was the last day of operation for the Cogeneration Unit . The unit was removed by November 30, 2019 according to the facility. The Cogeneration Unit was the only source in the Title V operating permit.

It is recommended that TVOP 23-00084 be revoked.

cc: Division of Permits, Harrisburg, DEP
Mr. Gallagher, EGM
Mr. Trivedi, Harrisburg DEP
File: TVOP 23-00084

Attachment 3 – Emails from Ms. Jennifer Eisenmann

From: Eisenmann, Jennifer(GE Gas Power) <Jennifer.Eisenmann@ge.com>
Sent: Wednesday, September 30, 2020 7:40 PM
To: Guo, Jing <jguo@pa.gov>
Subject: [External] RE: Marcus Hook Plant 750, 23-00089, AGP: heat input increasing: Turbine and Duct Burner"

Hi Jane.

There was no change to any heat input – not the turbines or duct burners. The heat input in the permit should still reflect the heat inputs prior to the AGP project – 1949 and 333 for the turbines and duct burners respectively. Does this answer your question?

Thanks,
Jen

Jennifer Eisenmann
Environmental, Health and Safety Manager
Marcus Hook Energy Center
100 Green Street
Marcus Hook, PA 19061
O: 610-364-2470
C: 215-262-2923
Jennifer.Eisenmann@ge.com

From: Guo, Jing <jguo@pa.gov>
Sent: Wednesday, September 2, 2020 8:18 AM
To: Eisenmann, Jennifer(GE Gas Power) <Jennifer.Eisenmann@ge.com>
Subject: EXT: Marcus Hook Plant 750, 23-00089, AGP: heat input increasing: Turbine and Duct Burner"

Good morning, Jennifer.
Prior to the AGP project,
Turbine heat input: 1,949 MMBtu/hr; Duct burner heat input: 333 MMBtu/hr (total heat input: 2,357 MMBtu/hr)

After the AGP project, total heat input: 2,357 MMBtu/hr.
What is heat input for Turbine and Duct Burner, respectively?

Thanks.

Jane (Jing) Guo | Engineering Specialist
Department of Environmental Protection | Southeast Regional Office
2 East Main Street | Norristown, PA 19401
Phone: 484.250.5065 Fax: 484.250.5921
www.dep.pa.gov

From: Eisenmann, Jennifer(GE Gas Power) <Jennifer.Eisenmann@ge.com>
Sent: Wednesday, September 30, 2020 7:38 PM
To: Guo, Jing <jguo@pa.gov>
Cc: Eisenmann, Jennifer(GE Gas Power) <Jennifer.Eisenmann@ge.com>
Subject: [External] RE: Marcus Hook Plant 750, 23-00089, "Small Boilers ?"

Jane,

See my responses in red below.

Thanks,

Jen

Jennifer Eisenmann
Environmental, Health and Safety Manager
Marcus Hook Energy Center
100 Green Street
Marcus Hook, PA 19061
O: 610-364-2470
C: 215-262-2923

From: Guo, Jing <jguo@pa.gov>
Sent: Monday, August 31, 2020 10:01 AM
To: Eisenmann, Jennifer(GE Gas Power) <Jennifer.Eisenmann@ge.com>
Subject: EXT: RE: Marcus Hook Plant 750, 23-00089, "Small Boilers ?"

Hi, Jennifer,

I have two more questions regarding Marcus Hook Energy 750 MW plant.

Steam

"MH provides excess steam to Sunoco Partners Marketing and Terminals, L. P. (Sunoco Partners), from the Heat Recovery Steam Generator(s) and operate Auxiliary Boiler(s) under the direction Sunoco to satisfy their steam demands. Sunoco has the option of taking excess steam as available from MH 750MW or operating its boilers as needed. " - what is current status for steam supply?
Marcus Hook Energy produces steam from the Heat Recovery Steam Generators on each of the three combustion turbines. Operation of the Auxiliary Boilers has transferred back to Sunoco. Marcus Hook Energy provides steam to Sunoco as needed for Sunoco's operations.

Fuel

In 2015, "Sunoco Partners is constructing cryogenic ethane and propane storage facility (storage tanks), and natural gasoline (liquid natural gas) storage tanks. MH 750MW intends to use Sunoco gaseous fuels in the duct burners, and requests that the renewal be updated to including gaseous fuels from Sunoco Partners as alternative fuel for the duct burners." - does MH 750 use gaseous fuels from Sunoco? **Yes, MH750 uses gaseous fuel from Sunoco. In the permit, it is still referred to as "refinery gas" and it is used in the duct burners only. However, Sunoco has ceased operation as a refinery and continuing to call the fuel "refinery gas" is misleading. Since Sunoco is now a natural gas storage facility, the fuel MH750 receives from Sunoco is referred to as "Other Gas".**

Jane (Jing) Guo | Engineering Specialist
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Attachment 4 - Stack Testing (2017)

pennsylvania
DEPARTMENT OF ENVIRONMENTAL PROTECTION

MEMO

TO Heather Henry
Air Quality Specialist
Southeast Regional Office

FROM William Schneider
Source Testing Section

THROUGH Charles Zadakis
Environmental Program Manager
Division of Source Testing and Monitoring

Rick Szekeres
Environmental Group Manager
Source Testing Section

DATE February 13, 2019

RE Source Test Audit Review
Marcus Hook Energy, LP
Combustion Turbine 1 (CT1) & Duct Burner 1 (Source ID 101)
CT1 Selective Catalytic Reduction (SCR; C01)
Combustion Turbine 2 (CT2) & Duct Burner 2 (Source ID 102)
CT2 Selective Catalytic Reduction (SCR; C02)
Combustion Turbine 3 (CT3) & Duct Burner 3 (Source ID 103)
CT3 Selective Catalytic Reduction (SCR; C03)
Marcus Hook Borough, Delaware County
Title V Operating Permit No. 23-00089
eFACTS: 2586558 PFID: 654588
eFACTS Inspection Result: NOVIO

MESSAGE:
Marcus Hook Energy (formerly FPL) operates three natural-gas fired combustion turbine (CT) generators, three associated duct burners, and a common steam turbine generator at its nominal 750 MW combined cycle power generating facility. These units are identified as "1", "2" and "3" in the facility's operating permit, which presumably would correspond to "CT1A", "CT1B", and "CT1C, the way these units are mostly referred to in the 2017 O'Brien and Gere emissions test report. Per the description in the test report, each combustion turbine generator, is a General Electric Model 7FA, with a maximum heat input rating of about 1949 MMBtu/hr, HHV, and a nominal rating of about 183 MW. Each unit includes a heat recovery steam generator (HRSG) and a supplemental energy duct burner, rated at about 333 MMBtu/hr. The HRSGs and duct burners are used to provide energy to fire the common steam turbine generator, with a nominal rating of 231 MW. The combined heat input from each unit's combustion turbine and duct burner is about 2282 MMBtu/hr, HHV. Per the facility's operating permit,

the combustion turbines can only be fired with natural gas, whereas the duct burners can be fired with gaseous fuels that meet certain specifications. Nitrogen oxides (NO_X) emissions from each unit's combustion turbine and duct burner are controlled by individual selective catalytic reduction (SCR) systems. Exhaust emissions are sent to the atmosphere via individual 12 ft (240 in) ID outlet stacks.

Per TVOP-23-00089, O'Brien and Gere, Inc. conducted outlet testing for a combined train of filterable particulate matter (FPM; EPA Method 5) and condensable particulate matter (CPM; EPA Method 202), sulfur oxides (SO_X; EPA Method 8), and total hydrocarbons (THC; EPA Method 25A), during December 20-21, 2016 for Units CT1B and CT1C and on January 5, 2017 for Unit CT1A. F-factor analysis (EPA Method 19) was used to determine lb/MMBtu values, using the standard value of 8710 dscf/MMBtu for natural gas. Testing was conducted with each unit's combustion turbine and duct burner being fired with natural gas. Per the pre-test approval, the duct burners were fired with natural gas, as prior to testing, the facility representative at that time, indicated that since 2012, there was only one four-day time period, when the duct burners were being fired with a gaseous fuel other than natural gas and at that time, that facility representative indicated there were no future plans to use any gaseous fuel, other than natural gas, in the duct burners.

A pre-test protocol was approved. The tests are acceptable to the Department of Environmental Protection (DEP) as a credible representation of the actual emissions under the operating conditions at the time of testing and may be used for compliance purposes. Comment No. 1 below addresses the operating conditions during testing and Comment No. 2 addresses the audit samples analyzed as part of the testing.

1. The protocol proposed to test at the maximum achievable rate, whereas the test report indicated that testing was conducted at normal, steady state operations. In an e-mail response to the above discrepancy, the current facility representative indicated the protocol referred to the combustion turbines, which were operated at near rated heat input capacity during testing. As shown in the tables of this memo, the combustion turbines operated at approximately 97 to 99% of their heat input capacity, whereas the duct burners operated at approximately 11%, 20 to 30% and 16 to 19%, for Units CT1A, CT1B and CT1C respectively, of their heat input capacity. The current facility representative indicated that the duct burners were operated according to their normal operating procedures and with the combined total duct burner maximum achievable heat input rate, split across the three duct burners. The three duct burners/HRSGs serve a common steam turbine, with a maximum safe reheat steam system pressure limiting the total heat input from all three duct burners, which under normal operating procedures requires the fuel to be split across the three duct burners. Each combined cycle system operating load during testing for the sum of its CT MW and its apportioned steam turbine MW was reported in the above e-mail as approximately 283, 287, 284 MW, respectively, for the three units or 94% or greater of the combined 300 MW maximum total operating load for each unit.

2. For certain methods, including EPA Method 8, blind audits, provided by an approved laboratory, need to be analyzed by the analytical laboratory analyzing the test samples, as an additional QA/QC check for the analytical laboratory. The audit provider will determine if the analytical laboratory audit results fall within the acceptable range. The audits are to be analyzed at the same time as the test samples and by the same analyst. For this testing program, audit samples were only analyzed in

conjunction with the Unit CT1A samples, which were analyzed approximately 1 month after the analysis of the samples from the other two units. A reasonable explanation was provided by the current facility representative in an e-mail response as summarized below:

> Testing was scheduled for the week of December 19, 2016. An attempt was made by O'Brien & Gere to procure the audits in mid-November, but as explained in the e-mail, due to issues involving the concentrations to be ordered for these audits, a second order needed to be placed on December 5, 2016. Testing was conducted on Units CT1B and CT1C during the week of December 19, 2016, but testing could not be conducted on Unit CT1A until January 2017. As the audits had not yet arrived and due to concern about holding the samples for Units CT1B and CT1C, they decided to have those samples analyzed, without the audits.

The following results were extracted from the test report:

CT1A SOx Outlet Emissions while Firing Natural Gas (01/05/17) [1]

Parameter	Run 1 01/05/17	Run 2 01/05/17	Run 3 01/05/17	Average	Allowable
Volumetric flow rate (dscfm)	864,651	807,006	800,232	823,963	
SO_X					
Sulfuric acid mist					
mg/dscm	<0.29	<0.36	<0.27	<0.31	
lb/hr	<0.94	<1.09	<0.81	<0.95	
lb/MMBtu	<0.0004	<0.0005	<0.0004	<0.0005	≤0.0030 [3]
Sulfur dioxide (SO_2)					
mg/dscm	<0.07	<0.06	<0.07	<0.07	
lb/hr	<0.21	<0.19	<0.21	<0.20	
lb/MMBtu [2]	<0.0001	<0.0001	<0.0001	<0.0001	≤0.0080 [3]

[1] The facility's parameters for the combustion turbine generator and the duct burner are the same as the preceding table as the SO_X testing was conducted during the same time period.

[2] The SO_2 lb/MMBtu values are as reported in revised versions, submitted by the facility, of Tables 2 (CT1A), 5 (CT1B) and 8 (CT1C) of the test report. The original Tables 2 and 5 in the test report inadvertently reported the Test Run No. 1 SO_2 lb/MMBtu value using the same value that was reported for the sulfuric acid mist lb/MMBtu, Test Run No. 3 was reported as <0.0000 in all three tables and the overall 3-run test average was not correct in Tables 2 and 5.

[3] These are the permit allowables for firing the combustion turbine and the duct burner, which are based on 1-hour averages, with the SO_X test runs 192 minutes. There are separate allowables for firing the combustion turbine alone, a scenario which was not evaluated during this testing program.

EPA Method 8 audits were checked and determined to be acceptable by the laboratory providing the audits.

CT1A PM and THC Outlet Emissions while Firing Natural Gas (01/05/17)

Parameter	Run 1 01/05/17	Run 2 01/05/17	Run 3 01/05/17	Average	Allowable
Combustion turbine generator					
Fuel flow (Kscfh)	1838	1841	1835		
Heat input (MMBtu/hr; % of capacity) [1]	1930; 99	1933; 99	1927; 99		
Electrical output (MW; % of capacity) [1]	197; 108	197; 108	195; 107		
Duct burner					
Fuel flow (Kscfh)	35.0	33.5	35.2		
Heat input (MMBtu; % of capacity) [1]	36.8; 11	35.2; 11	37.0; 11		
Volumetric flow rate (dscfm)	821,969	821,244	812,625	818,613	
FPM (EPA Method 5)					
gr/dscf	<0.0002	<0.0003	<0.0002	<0.0002	
lb/hr	<1.74	<1.80	<1.39	<1.64	
lb/MMBtu	<0.0008	<0.0009	<0.0007	<0.0008	
CPM (EPA Method 202)					
gr/dscf	<0.0005	<0.0005	<0.0004	<0.0005	
lb/hr	<3.18	<3.39	<3.08	<3.22	
lb/MMBtu	<0.0015	<0.0017	<0.0015	<0.0016	
Total PM (EPA M5+202)					
gr/dscf	<0.0007	<0.0008	<0.0006	<0.0007	
lb/hr	<4.92	<5.19	<4.47	<4.86	
lb/MMBtu	<0.0023	<0.0026	<0.0022	<0.0024	≤0.015 [2]
THC (EPA Method 25A as propane) [3]					
ppmvd @ 15% O_2	ND	ND	ND	ND	≤3.1 [2,3]
lb/hr	ND	ND	ND	ND	
lb/MMBtu	ND	ND	ND	ND	

[1] The % of capacity was determined by the reviewer. The duct burner heat input was determined by the reviewer, based on the fuel flow data provided in the test report and using a natural gas heating value of 1050 Btu/dscf. The latter value was apparently the heating value used by the facility to determine the combustion turbine heat input, based on the reviewer calculations of dividing the facility's combustion turbine heat input by the facility's fuel flow values.

[2] These are the permit allowables for firing the combustion turbine and the duct burner, which are based on 1-hour averages, with the PM test runs being 192 minutes and the THC test runs being 180 minutes. There are separate allowables for firing the combustion turbine alone, a scenario which was not evaluated during this testing program.

[3] The test run averages were slightly negative, which were reported in the summary tables of the test report as 0.0 and reported in the above tables as non-detectable (ND). Per Section F of the permit, the allowable is calculated as methane. Using a theoretical conversion of 1/3 to convert ppm as methane to ppm as propane would yield an allowable of 1.0 ppmvd @ 15% O_2 as propane.

CT1B PM and THC Outlet Emissions while Firing Natural Gas (12/20/16-12/21/16)

Parameter	Run 1 12/20/16	Run 2 12/21/16	Run 3 12/21/16	Average	Allowable
Combustion turbine generator					
Fuel flow (Kscfh)	1844	1846	1851		
Heat input (MMBtu/hr; % of capacity) [1]	1936; 99	1938; 99	1943; 99		
Electrical output (MW; % of capacity) [1]	195; 107	195; 107	195; 107		
Duct burner					
Fuel flow (Kscfh)	96.1	63.1	63.0		
Heat input (MMBtu/hr; % of capacity) [1]	101; 30	66.3; 20	66.2; 20		
Volumetric flow rate (dscfm)	830,253	843,311	847,136	840,234	
FPM (EPA Method 5)					
gr/dscf	≤0.0003	≤0.0003	≤0.0002	≤0.0003	
lb/hr	≤1.85	≤2.03	≤1.75	≤1.88	
lb/MMBtu	≤0.0009	≤0.0010	≤0.0008	≤0.0009	
CPM (EPA Method 202)					
gr/dscf	≤0.0005	≤0.0003	≤0.0004	≤0.0004	
lb/hr	≤3.61	≤2.21	≤3.16	≤2.99	
lb/MMBtu	≤0.0017	≤0.0010	≤0.0015	≤0.0014	
Total PM (EPA M5+202)					
gr/dscf	≤0.0008	≤0.0006	≤0.0006	≤0.0007	
lb/hr	≤5.46	≤4.24	≤4.91	≤4.87	
lb/MMBtu	≤0.0026	≤0.0020	≤0.0023	≤0.0023	≤0.015 [2]
THC (EPA Method 25A as propane) [3]					
ppmvd @ 15% O_2	ND	ND	ND	ND	≤3.1 [2,3]
lb/hr	ND	ND	ND	ND	
lb/MMBtu	ND	ND	ND	ND	

[1,2,3] Same footnotes as appear under the CT1A PM and THC table on p. 4 of this memo.

CT1B SOx Outlet Emissions while Firing Natural Gas (12/20/16-12/21/16) [1]

Parameter	Run 1 12/20/16	Run 2 12/21/16	Run 3 12/21/16	Average	Allowable
Volumetric flow rate (dscfm)	893,677	894,006	918,442	902,042	
SO_X					
Sulfuric acid mist					
mg/dscm	≤0.39	≤0.34	≤0.32	≤0.35	
lb/hr	≤1.31	≤1.14	≤1.10	≤1.18	
lb/MMBtu	≤0.0006	≤0.0005	≤0.0005	≤0.0005	≤0.0030 [3]
Sulfur dioxide (SO_2)					
mg/dscm	≤0.04	≤0.05	≤0.05	≤0.05	
lb/hr	≤0.13	≤0.18	≤0.17	≤0.16	
lb/MMBtu [2]	≤0.0001	≤0.0001	≤0.0001	≤0.0001	≤0.0080 [3]

[1,2,3] Same footnotes as appear under the CT1A SO_X table on p. 5 of this memo, with the exception that there were no audits analyzed with these test samples as discussed in Comment No. 2 on pp. 2-3 of this memo.

CT1C PM and THC Outlet Emissions while Firing Natural Gas (12/20/16-12/21/16)

Parameter	Run 1 12/20/16	Run 2 12/21/16	Run 3 12/21/16	Average	Allowable
Combustion turbine generator					
Fuel flow (Kscfh)	1806	1812	1814		
Heat input (MMBtu/hr; % of capacity) [1]	1897; 97	1902; 98	1905; 98		
Electrical output (MW; % of capacity) [1]	196; 107	195; 107	196; 107		
Duct burner					
Fuel flow (Kscfh)	60.1	50.5	49.6		
Heat input (MMBtu/hr; % of capacity) [1]	63.1; 19	53.0; 16	52.1; 16		
Volumetric flow rate (dscfm)	819,849	817,886	775,564	804,433	
FPM (EPA Method 5)					
gr/dscf	0.0005	<0.0004	<0.0003	<0.0004	
lb/hr	3.20	<2.57	<1.69	<2.49	
lb/MMBtu	0.0015	<0.0013	<0.0009	<0.0012	
CPM (EPA Method 202)					
gr/dscf	<0.0003	<0.0003	<0.0002	<0.0003	
lb/hr	<2.34	<2.42	<1.47	<2.08	
lb/MMBtu	<0.0011	<0.0012	<0.0008	<0.0010	
Total PM (EPA M5+202)					
gr/dscf	<0.0008	<0.0007	<0.0005	<0.0007	
lb/hr	<5.54	<4.99	<3.16	<4.56	
lb/MMBtu	<0.0026	<0.0025	<0.0017	<0.0023	≤0.015 [2]
THC (EPA Method 25A as propane) [3]					
ppmvd @ 15% O_2	ND	ND	ND	ND	≤3.1 [2,3]
lb/hr	ND	ND	ND	ND	
lb/MMBtu	ND	ND	ND	ND	

[1,2,3] Same footnotes as appear under the CT1A PM and THC table on p. 4 of this memo.

CT1C SOx Outlet Emissions while Firing Natural Gas (12/20/16-12/21/16) [1]

Parameter	Run 1 12/20/16	Run 2 12/21/16	Run 3 12/21/16	Average	Allowable
Volumetric flow rate (dscfm)	788,732	838,427	813,227	813,462	
SO_X					
Sulfuric acid mist					
mg/dscm	<0.34	0.36	<0.35	<0.35	
lb/hr	<1.02	1.14	<1.07	<1.08	
lb/MMBtu	<0.0005	0.0005	<0.0005	<0.0005	≤0.0030 [3]
Sulfur dioxide (SO_2)					
mg/dscm	<0.07	<0.07	<0.06	<0.06	
lb/hr	<0.20	<0.22	<0.17	<0.20	
lb/MMBtu [2]	<0.0001	<0.0001	<0.0001	<0.0001	≤0.0080 [3]

[1,2,3] Same footnotes as appear under the CT1A SO_X table on p. 5 of this memo, with the exception that there were no audits analyzed with these test samples as discussed in Comment No. 2 on pp. 2-3 of this memo.

Process Data (more details in the test report):

Appendix B of the test report contains data for various operating parameters including the following whose test runs averages are shown in the tables of this memo: each combustion turbine generator's fuel flow rate, heat input and electrical output (MW), and each duct burner's fuel flow rate. Another parameter reported was the SCR catalyst temperature, whose test run averages were between approximately 654 and 666°F during testing. The SCR reagent flow, which was to be included in the test report, per the DEP conditional approval submitted in response to the protocol, was not included in the test report. However, the SCR reagent flow would probably have the largest impact on nitrogen oxides (NO_X) emissions, which were not evaluated during this testing program.

cc: Reading File, Source Testing Section
EPA/AKB